Prevalence of HIV, Hepatitis B, and Hepatitis C in People With Severe Mental Illness

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ABSTRACT

Objectives. This study assessed seroprevalence rates of HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV) among individuals with severe mental illness.

Methods. Participants (n=931) were patients undergoing inpatient or outpatient treatment in Connecticut, Maryland, New Hampshire, or North Carolina.

Results. The prevalence of HIV infection in this sample (3.1%) was approximately 8 times the estimated US population rate but lower than rates reported in previous studies of people with severe mental illness. Prevalence rates of HBV (23.4%) and HCV (19.6%) were approximately 5 and 11 times the overall estimated population rates for these infections, respectively.

Conclusions. Elevated rates of HIV, HBV, and HCV were found. Of particular concern are the high rates of HCV infection, which are frequently undetected. Individuals with HCV infection commonly fail to receive appropriate treatment to limit liver damage and unknowingly may be a source of infection to others. (*Am J Public Health.* 2001;91: 31–37)

People with severe mental illness represent approximately 2.6% of the US population.[1] Criteria for severe mental illness include presence of a major mental illness, chronicity, and pervasive impairment of function.[2–5] Such impairments are most often present in schizophrenia spectrum disorders (e.g., schizophrenia, schizoaffective disorder), bipolar disorder, and major depression, which together represent the preponderance of severe mental illness diagnoses.[6]

Along with their psychiatric impairment, persons with severe mental illness are at increased risk for several comorbid conditions such as substance use disorder.[7] They are also likely to be overrepresented in high-risk categories for infection not only with HIV but also with other pathogens with similar routes of transmission, such as hepatitis B virus (HBV) and hepatitis C virus (HCV).

Over the past 8 years, more than a dozen articles have reported elevated rates of HIV infection (5.2% to 22.9%) in people with severe mental illness[8–10]; comparable estimates in the overall US adult population are approximately 0.3% to 0.4%.[11] Relative to the general population, women with severe mental illness appear to be at particularly elevated risk (estimated infection rates of 5% vs 0.17%).[12,13] Despite the data regarding elevated prevalence rates of HIV/AIDS in people with severe mental illness, and despite reported elevations of infectious hepatitis in psychiatric patients in other countries,[14,15] there is a dearth of published information on the prevalence of HBV and HCV among people with severe mental illness in the US population.

Several explanations have been advanced to account for the increased prevalence of HIV/AIDS in persons with severe mental illness. Both the direct (e.g., affective lability) and indirect (e.g., homelessness) effects of severe mental illness have been hypothesized to increase high-risk behavior and result in elevated rates of HIV infection.[16] However, sampling issues limit interpretation of current findings regarding HIV infection in people with severe mental illness.[12] Most of the published seroprevalence data have been derived from relatively small convenience samples of patients in psychiatric treatment in New York City. These samples have also overrepresented inpatients, ethnic minority groups, and socioeconomic circumstances associated with high levels of HIV.

In general, people with severe mental illness appear to have increased rates of sexually transmitted diseases (STDs), and they are likely to engage in high-risk behaviors such as using

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injection drugs, having multiple sexual partners and high-risk partners, infrequently using condoms, engaging in same-sex sexual activity, trading sex for money or drugs, and engaging in sex while using psychoactive substances.[12,16,17] These risk factors, along with the poverty characteristic of people with severe mental illness, raise the concern that this population is also at elevated risk for HBV and HCV infection. Although these 2 infections are much more prevalent than HIV in the US population (estimated rates of 4.9% and 1.8%, respectively) and share key risk factors, no data on the prevalence of HBV and HCV among people with severe mental illness in the United States have been published.

Both HBV and HCV are major causes of liver disease, including cirrhosis and hepatocellular carcinoma.[18] However, the latter generally develops 1 to 3 decades after initial infection. The increasing number of cases of hepatocellular carcinoma[19] is but one indicator of the importance of identifying high-risk groups and individuals infected with either or both of these forms of hepatitis. To address these issues, the National Institute of Mental Health and the Department of Veterans Affairs (VA) sponsored a group of investigators in an effort to gather data on HIV, HBV, and HCV serostatus and risk behaviors in a large and diverse sample of people with severe mental illness.

Methods

Study Participants

Between June 1997 and December 1998, 931 individuals with severe mental illness took part in the study. Subjects were between the ages of 18 and 60 years, were fluent in English, and met common criteria for severe mental illness, including diagnosis of a major mental disorder, duration of at least 1 year, and disability in at least 2 life domains (e.g., work, social relationships). Approximately 87% of patients approached consented to take part in the assessments, with participation rates by site ranging from 72.3% to 93.2%. More than 93% of the respondents had diagnoses of schizophrenia spectrum disorders, bipolar disorder, or major depression, and more than 42% had a current comorbid substance use disorder.

All participants were recipients of inpatient (n=323) or outpatient (n=608) treatment through the public mental health systems of Connecticut, Maryland, New Hampshire, or North Carolina or treatment through the Durham, NC, VA hospital. Inpatient participants were consecutive, consenting patients admitted to the New Hampshire hospital or the Durham VA inpatient psychiatric unit during the study period. Outpatients were chosen in 1 of 2 ways: (1) randomly from the rolls of 3 community mental health centers (in New Hampshire and Baltimore, Md) serving as study sites (n=282) or (2) through participation in ongoing studies of mental health treatment in community settings. The second group had previously been selected to participate in studies of dual-diagnosis treatment in Bridgeport and Hartford, Conn (n=149) or of outpatient commitment following discharge from involuntary hospitalization in North Carolina (n=177). The Baltimore clients all met criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*,[20] for a schizophrenic spectrum disorder.

The Connecticut and Maryland samples were drawn from large metropolitan areas known to have high prevalence rates of HIV/AIDS and HCV, whereas the samples in New Hampshire and North Carolina were drawn from rural and smaller metropolitan areas and had much lower estimated population rates of these infections. In North Carolina, participants were residents of the Piedmont area, where the population is primarily African American. In the New Hampshire study sites, the population was more than 95% White, as is the state as a whole.

Sample demographic and diagnostic characteristics are summarized in Table 1. The sample was representative of patients with severe mental illness treated by public sector providers in these 4 states but overrepresented African Americans and men and underrepresented Hispanics. Other characteristics (e.g., psychiatric diagnoses, prevalence of substance use disorder, age, socioeconomic status, and marital status) were typical of other samples of individuals with severe mental illness.

Procedures

Assessments were conducted by experienced interviewers who received additional conjoint training on legal, ethical, and clinical issues regarding blood testing and pretest and posttest counseling. After informed consent was obtained, participants completed standardized interviews regarding sociodemographic characteristics, substance use, HIV risk behavior, HBV and HCV, history of STDs, health care, and other illness-related variables.

Participants also received pretest counseling for HIV/AIDS and provided blood specimens through either venipuncture (n=754) or finger stick (n=177). Specimens were analyzed at common sites (the University of Maryland or the Durham VA hospital) according to uniform laboratory procedures. All subjects were paid a participation fee of $35 and were provided with test results and posttest counseling. Participants with positive serology screens were provided relevant information and referred for follow-up testing and treatment with appropriate providers. These procedures, and the informed consent forms, were approved by the institutional review boards of the participating institutions.

Specimens

Blood specimens were collected at each site within 72 hours of informed consent and interview. A uniform protocol was used for the collection of blood to ensure consistency between sites. However, because outpatient participants in North Carolina (n=177) were assessed at remote sites where phlebotomist services were unavailable, blood specimens were collected through finger stick samples according to the method recommended by Genetic Systems (Redmond, Wash). Because finger stick samples are not appropriate for HBV or HCV antibody assessment, these participants were excluded from the hepatitis analyses.

Processing of Specimens, Laboratory Procedures, and Definitions

Serologic tests for HIV antibodies in serum included the Genetic Systems HIV-1/HIV-2 enzyme-linked immunosorbent assay (ELISA; Redmond, Wash). If tests were repeatedly reactive, further testing was performed with an HIV-1 Western blot (BioRad, Hercules, Calif) to confirm infection; criteria of the Centers for Disease Control and Prevention (CDC)/Association of State and Territorial Public Health Laboratory Directors were used in these analyses. Finger stick samples were tested similarly but with modifications to the ELISA, as recommended by Genetic Systems. All tests and procedures were licensed by the Food and Drug Administration (FDA).

Antibodies to hepatitis B core were assessed with the Abbott Corzyme test according to the manufacturer's criteria. Antibodies to HCV were assessed in serum via the Abbott HCV 2 ELISA. Initially reactive results were repeated in duplicate. At least 2 reactive results constituted a final result of HCV positive status. Confirmation of HCV was performed on 45 randomly drawn ELISA reactives. An FDA-licensed recombinant immunoblot (RIBA; Ortho, Raritan, NJ) was used according to the manufacturer's criteria. Results suggested an overall confirmation rate of more than 97% of ELISA positive tests. All serologic testing was performed in laboratories accredited by the College of American Pathologists under well-controlled conditions.

Additional Measures

To assess risk behaviors associated with HIV, HBV, and HCV, we used the AIDS Risk Inventory, a structured interview for assessing

TABLE 1—Comparison of Small/Nonmetropolitan and Large Metropolitan Area Background Characteristics: 4 US States, 1997–1998

	Total Sample (n=931)	Small/Nonmetropolitan (n=649)	Large Metropolitan (n=282)
Mean age, y (SD)	42.3 (10.1)	42.4 (10.5)	42.1 (9.2)
Female, %	35.1	34.5	36.5
Race, %			
White	48.4	58.6	25.2
Black	43.2	34.9	62.1
Hispanic	2.6	1.1	6.0
Other	5.8	5.4	6.7
Marital status, %			
Never married	51.5	44.7	67.0
Married	13.7	17.5	5.0
Divorced, widowed, or separated	34.8	37.8	28.0
Education level, %			
Less than high school	35.2	27.2	53.8
High school/general equivalency diploma	29.0	30.4	25.8
More than high school	35.8	42.4	20.4
Mean monthly income, $ (SD)	892 (734)	976 (829)	690 (351)
Currently employed, %	18.7	22.3	10.3
Homeless in past 6 mo[a], %	16.1	16.6	14.9
Psychiatric diagnosis, %			
Schizophrenia	44.9	37.6	61.7
Schizoaffective disorder	19.9	16.1	28.4
Bipolar disorder	16.8	21.6	6.0
Major depression	11.7	15.8	2.1
Other	6.7	8.9	1.8
Substance use[b]			
Alcohol use disorder	26.3	26.9	24.9
Drug use disorder	26.6	24.2	32.0
Any substance use disorder	42.7	41.0	46.6

[a]No regular residence, in a shelter, or on the streets.
[b]Assessed with the Dartmouth Assessment of Lifestyle Instrument.

risk behaviors associated with acquiring and transmitting these infections.[21,22] The AIDS Risk Inventory measures risky sexual practices such as unprotected sex and risky drug practices such as needle sharing. We modified the inventory for this study so that it would be easily understood by respondents with severe mental illness.

Substance use disorder was assessed with the Dartmouth Assessment of Lifestyle Instrument, which was specifically designed for use with severely mentally ill individuals.[23] This measure has high classification accuracy in terms of substance use disorder (alcohol, cannabis, and cocaine) among patients with severe mental illness.

Statistical Analyses

We calculated observed prevalence rates of HIV, HBV, and HCV for the entire sample. Because sites varied in the number of patients tested as well as in overall population density, weighted prevalence rates were calculated according to estimated populations,[24] and mean weighted prevalence rates were calculated across sites. To allow for more specific comparisons, we also calculated prevalence rates for the large metropolitan and small/nonmetropolitan sites. Bivariate relationships between selected risk variables and seroprevalence were examined via χ^2 analyses both before and after controlling for site. This procedure affected only 2 variables (race and multiple sex partners); thus, we focused on the original analysis. We also examined the relationship between risk variables and seroprevalence, controlling for injection drug use.

Results

A total of 931 participants provided blood samples suitable for HIV testing, and 25 (2.7%) of these individuals tested positive for infection via both ELISA and Western blot, yielding a site-weighted prevalence estimate of 3.1% for HIV. Seroprevalence rates were 5.0% at large metropolitan sites (n=282) and 1.7% at small or nonmetropolitan sites (n=649). The sex ratio for HIV infection was approximately 4 men to 3 women.

Blood samples suitable for HBV and HCV testing (i.e., venipuncture) were available for 751 participants. Although this group excluded the North Carolina outpatient sample, it included subjects from all participating states and large numbers of both large metropolitan area residents (n=280) and small or nonmetropolitan area residents (n=471). The observed prevalence of HBV core antibodies was 18.8%, yielding a site-weighted prevalence rate of 23.4%. Observed seroprevalence rates were 29.3% among metropolitan area participants (n=280) and 12.5% among small or nonmetropolitan area participants (n=471).

HCV rates were only slightly lower, with an observed prevalence of 16.1% and a site-weighted prevalence of 19.6%. HCV prevalence rates were 25.4% among residents of large metropolitan areas and 10.6% among residents of small/nonmetropolitan areas. When site was controlled for as a variable, HIV was significantly related to inpatient status (odds ratio [OR]=4.57, $P<.05$), but HBV and HCV were not. It should be noted that the HBV IgG core antibody test used here is a measure of exposure to this infection and does not indicate that an individual has chronic HBV infection. More than 90% of those who test positive will already have cleared the virus and thus will not have chronic infection.[25,26] In contrast, 85% of those who test positive for HCV will develop chronic infection, among whom 15% may go on to have serious complications.[27]

To better understand probable routes of transmission, we examined self-reported risk behaviors in those who tested positive for

TABLE 2—Seroprevalence of Hepatitis C for Selected Risk Groups: 4 US States, 1997–1998

	Severe Mental Illness Sample, No. (% positive)	US Population,[a] % Positive (95% Confidence Interval)
Race		
White	393 (11.2)	1.5 (1.1, 2.0)
Black	282 (22.7)	3.2 (2.6, 4.0)
Hispanic[b]	24 (29.2)	2.1 (1.7, 2.6)
Other	50 (10.0)	2.9 (1.4, 5.8)
Sex		
Male	508 (19.1)	2.5 (2.0, 3.2)
Female	243 (9.9)	1.2 (0.9, 1.6)
Years of education		
≤12	471 (16.8)	2.8 (2.1, 3.6)
>12	276 (15.2)	1.3 (0.8, 2.0)
Area of residence		
Metropolitan	280 (25.4)	2.2 (1.6, 2.8)
Small/nonmetropolitan	471 (10.6)	1.6 (1.1, 2.2)
Injection drug use		
Current	18 (66.7)	79 (72, 86)
Lifetime	145 (62.1)	. . .
No. of sex partners (6 mo)[c]		
2–9	152 (23.0)	2 (1, 2)
10–49	10 (10.0)	3 (3, 4)
History of sexually transmitted disease	250 (28.4)	6 (1, 10)
Male history of same-sex sexual encounters	108 (20.4)	4 (2, 18)

Note. NHANES = National Health and Nutrition Examination Survey; CDC = Centers for Disease Control and Prevention.
[a]Estimates drawn from NHANES III.
[b]This category is "Mexican American" in the CDC sample.
[c]This variable is "lifetime" in the CDC sample.

HCV, examining risk categories cited by the CDC in descending order. Of 122 people with HCV, 91 (75%) were injection drug users, leaving 31 participants who tested positive but reported never having used injection drugs. Of these 31 individuals, 21 (68%) acknowledged having sniffed cocaine, 17 (55%) had used crack, and 24 (77%) had used both types of cocaine. Of the remaining 7 participants who did not report possible drug-related HCV exposure, 1 had a history of STDs, 2 had been sexually assaulted, and 2 had a history of poverty. This left only 2 HCV-positive participants (1.6%) with no self-reported risk, in comparison with the 10% of participants with no known risk across CDC studies of routes of HCV transmission.[28]

We also observed substantial rates of coinfection. Sixty-six (54.1%) of the 122 participants with HCV infection also tested positive for HBV. Of the 22 participants who tested positive for HIV and for whom venipuncture blood was available, 14 (63.6%) also tested positive for HBV, 13 (59.1%) tested positive for HCV, and 10 (45.5%) were infected with both HBV and HCV.

HCV seroprevalence rates for the severe mental illness sample, by demographic characteristics and risk factors, are shown in Table 2. General population estimates, drawn from data reported in the Third National Health and Nutrition Examination Survey, are provided as framing information and are not intended as direct comparisons because of differences in sampling procedures. The severe mental illness sample exhibited elevated rates of infection in relation to education, residence, number of sex partners, and STD history. Rates varied from 3 to 20 times the estimated prevalence rates for similar groups without severe mental illness. However, in the severe mental illness sample, injection drug users appeared to have an HCV prevalence rate comparable to that of injection drug users without severe mental illness.

Rates also varied by site, as would be predicted according to population base rates. Connecticut had the highest rates for all 3 infections, with 5.4% of individuals positive for HIV and 30.4% positive for both HBV and HCV. The corresponding rates in New Hampshire, at the other end of the spectrum, were less than 1%, 8%, and approximately 6.6%. Unlike the overall population pattern, ethnicity was unrelated to HIV and HCV in the severe mental illness sample when we controlled for site. However, African Americans were more likely to have HBV. Older participants were more likely to have HBV and HCV but not HIV. The higher prevalence of HCV in older participants is congruent with other reports of age-specific rates for cohorts born in the 1950s.[28] The relatively small number of Hispanic participants limits conclusions about the apparent elevated risk in this group.

Table 3 presents the odds ratios for all 3 infections by risk category. Injection drug use ($P < .001$), use of crack cocaine ($P < .001$), and substance use disorder ($P < .01$) were significant risk factors for each of these infections. These results underline the centrality of substance use disorder, particularly injection drug and cocaine use, in all 3 infections. We also compared risk factors for any infection in the large metropolitan vs the small or nonmetropolitan area sites and found virtually identical results. Substance use disorder, injection drug use, sharing needles, snorting drugs, using crack cocaine, having a history of STDs, and trading sex for money or drugs correlated with infection ($P < .01$) in both settings. When seroprevalence rates among participants in the severe mental illness group who did not have major risk factors (self-reported history of injection drug use, substance use disorder, sex trading, or other STDs) were examined, rates of infection fell to 0.7% for HIV, 8.5% for HBV, and 4.3% for HCV.

Discussion

The results of this study indicate that patients with severe mental illness, in comparison with estimates for the overall US adult population, exhibit elevations in prevalence of HIV, HBV, and HCV. The prevalence of HIV found in this study was approximately 8 times the overall estimated US population prevalence. Although far in excess of US population estimates, the prevalence of HIV in our sample fell below previously published prevalence estimates of HIV/AIDS infection in people with severe mental illness. However, our results did replicate previous findings of near equality of HIV risk by sex (4 men to 3 women), contrasting markedly with a general population ratio of approximately 5 to 1. The prevalence of HBV in our sample was almost 5 times the US prevalence estimate, and HCV showed the highest elevation, approximately 11 times the estimated US adult population prevalence.

Although routes of transmission were not ascertained in this study, the high rates of substance use disorder, particularly injection drug use among women, are likely to contribute to increased risk. Substance use disorder, and particularly injection drug use, increased risk of all 3 infections anywhere from 2.2-fold to more than 31-fold, with HCV showing the greatest

TABLE 3—Bivariate Relationships Between Selected Risk Variables and Seroprevalence of HIV, Hepatitis B, and Hepatitis C: 4 US States, 1997–1998

	HIV			Hepatitis B			Hepatitis C		
	No. (% Positive)	Odds Ratio	95% Confidence Interval	No. (% Positive)	Odds Ratio	95% Confidence Interval	No. (% Positive)	Odds Ratio	95% Confidence Interval
Substance use disorder									
Present	397 (4.3)	2.93*	1.25, 6.86	347 (23.3)	1.74*	1.20, 2.51	347 (22.5)	2.42**	1.62, 3.63
Absent	532 (1.5)	1.00		402 (14.9)	1.00		402 (10.7)	1.00	
Injection drug use: lifetime									
Present	162 (8.6)	6.49**	2.89, 14.58	145 (42.1)	4.76**	3.17, 7.13	145 (62.1)	31.25**	18.47, 49.52
Absent	766 (1.4)	1.00		604 (13.2)	1.00		604 (5.1)	1.00	
Shared needles: lifetime									
Yes	115 (9.6)	6.03**	2.67, 13.63	104 (48.1)	5.63**	3.61, 8.77	104 (66.3)	22.44**	13.67, 36.85
No	812 (1.7)	1.00		644 (14.1)	1.00		644 (8.1)	1.00	
Sniff/snort drugs: lifetime									
Yes	491 (3.7)	2.34	0.97, 5.66	431 (23.9)	2.31**	1.54, 3.47	431 (23.0)	4.01**	2.46, 6.53
No	438 (1.6)	1.00		318 (11.9)	1.00		318 (6.9)	1.00	
Crack use: lifetime									
Yes	358 (5.0)	4.23**	1.75, 10.23	301 (30.2)	3.43**	2.34, 5.04	301 (31.2)	7.05**	4.45, 11.15
No	566 (1.2)	1.00		446 (11.2)	1.00		446 (6.1)	1.00	
Sexual partners: past 6 mo									
2 or more	196 (5.1)	2.30	0.94, 5.62	162 (29.6)	2.19**	1.41, 3.40	162 (22.2)	1.62	1.01, 2.59
1	286 (1.7)	0.76	0.26, 2.25	225 (15.1)	0.92	0.58, 1.47	225 (13.8)	0.90	0.56, 1.46
0	438 (2.3)	1.00		353 (16.1)	1.00		353 (15.0)	1.00	
History of sexually transmitted disease									
Yes	284 (6.3)	6.10**	2.52, 14.78	250 (30.4)	2.87**	1.97, 4.18	250 (28.4)	3.51**	2.35, 5.24
No	638 (1.1)	1.00		492 (13.2)	1.00		492 (10.2)	1.00	
Male history of same-sex sexual encounters									
Yes	127 (5.5)	2.60	0.97, 6.96	108 (20.4)	1.05	0.62, 1.79	108 (20.4)	1.09	0.64, 1.85
No	455 (2.2)	1.00		383 (19.6)	1.00		383 (19.1)	1.00	
Traded sex for drugs, gifts, or money: lifetime									
Yes	225 (6.7)	5.31**	2.29, 12.31	190 (27.4)	1.98**	1.33, 2.93	190 (26.3)	2.38**	1.58, 3.59
No	678 (1.3)	1.00		537 (16.0)	1.00		537 (13.0)	1.00	

Note. Results were unchanged after controlling for site. Hepatitis analyses were based on 751 participants (North Carolina outpatients were excluded).
*$P < .01$; **$P < .001$.

drug-related risk. In general, it appears that the risk factors operant for HIV, HBV, and HCV in people with severe mental illness are very similar to the risk factors present in the general population. Elevated rates within several risk categories may reflect the poverty, risky environments, and overall poor health and medical care common in people with severe mental illness.

Although our sample was larger and more diverse than those in parallel previous studies of severe mental illness, it was nonetheless a convenience sample. As such, our results may have been affected by various sampling biases, the most obvious of which is regional bias. All participants were drawn from 4 eastern states, and seroprevalence rates among individuals with severe mental illness in other parts of the United States may be higher or lower than those we found. Our sample did not include the 10 largest US cities. Also, as discussed earlier, the current sample lacked sufficient numbers of some important groups, including Hispanic participants and individuals with severe mental illness not receiving treatment from public sector providers. Clearly, more systematic sampling techniques are required to clarify these issues.

Even given the limitations of the current study, it would appear that greater efforts at prevention, screening, and treatment for HIV, HBV, and HCV are important. Of particular concern is the previously unreported seroprevalence of HCV in people with severe mental illness in the United States. Although practice guidelines are available for mental health providers to address HIV/AIDS, there is a lack of information and concern about HCV on the part of both providers and patients with severe mental illness. In the course of conducting posttest counseling for this study, it became apparent that the great majority of clients infected with HIV were aware of their condition, but most of those with HCV were not. This lack of awareness is not surprising, given the long period of asymptomatic infection, the nonspecificity of symptoms, and the insidious development of liver disease over decades.

Both incidence and mortality rates of hepatocellular carcinoma continue to rise and are expected to do so for the immediate future.[19] Risk for this disorder is associated primarily with HBV, HCV, and alcoholic cirrhosis. Our data suggest that people with severe mental illness, who exhibit elevated rates of both HBV and HCV and who also have very high lifetime prevalence rates of alcohol use disorder, are at unusually high risk for developing severe liver disease. There are currently neither practice guidelines nor programs for screening, testing, immunizing (for HBV), or treating people with severe mental illness who have contracted these forms of hepatitis. This increases the likelihood that many patients with severe mental illness, particularly those in the 40- to 55-year age group with chronic HBV, HCV, or both, are in the process of developing cirrhotic liver disease or have asymptomatic hepatocellular carcinoma.

For those patients with chronic HBV or HCV infection, prevention of cirrhosis and hepatocellular carcinoma should be a priority. Newer combination therapies involving interferon and ribavirin have achieved sustained response rates of 40% to 60%.[29–31] However, these treatments are lengthy, are difficult to tolerate, and, for patients with severe mental illness, may be complicated by a number of factors. One common side effect of interferon is depressed mood, so its use may be contraindicated for patients who are vulnerable to severe depression and mood instability. Also, it is not clear that patients with severe mental illness can be successfully recruited and retained in treatment protocols for HBV or HCV.

Clearly a need exists for data on these issues and for the development of "best practices" models for people with severe mental illness (particularly those with comorbid substance use disorders) as well as HIV, HBV, or HCV infection. For such individuals who are at risk but have not yet developed HIV infection, promising preventive interventions have been designed to reduce high-risk sexual behavior.[32–34] Previous experience with this population suggests that a cornerstone of successful intervention will be integrated dual-diagnosis treatment in the context of intensive case management.[35] □

Contributors

S. D. Rosenberg, L. A. Goodman, F. C. Osher, M. S. Swartz, S. M. Essock, and M. I. Butterfield were jointly involved in the planning and execution of the study design, including selection of variables and assessment instruments, and the conduct of the study in the field. N. T. Constantine designed and conducted the laboratory procedures and contributed particularly to interpretation of the laboratory results. G. L. Wolford and M. P. Salyers contributed to the design of the data-analytic plan, executed the data analysis, and contributed to the interpretation of the study results. All authors contributed to the drafting, editing, and revision of the paper.

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